

Stored Thermal Energy in Fire Fighter Protective Garments

Angie Shepherd and William Haskell, NIOSH/NPPTL, Pittsburgh, PA

Project Goals

- To assist in the development of an apparatus and a procedure to measure the stored thermal energy (STE) in material composites
- To manage variability studies between test labs using the STE method and apparatus
- To provide input to the ASTM standard entitled “Standard Test Method for Measuring the Transmitted and Stored Energy of Firefighter Protective Clothing Material Systems”

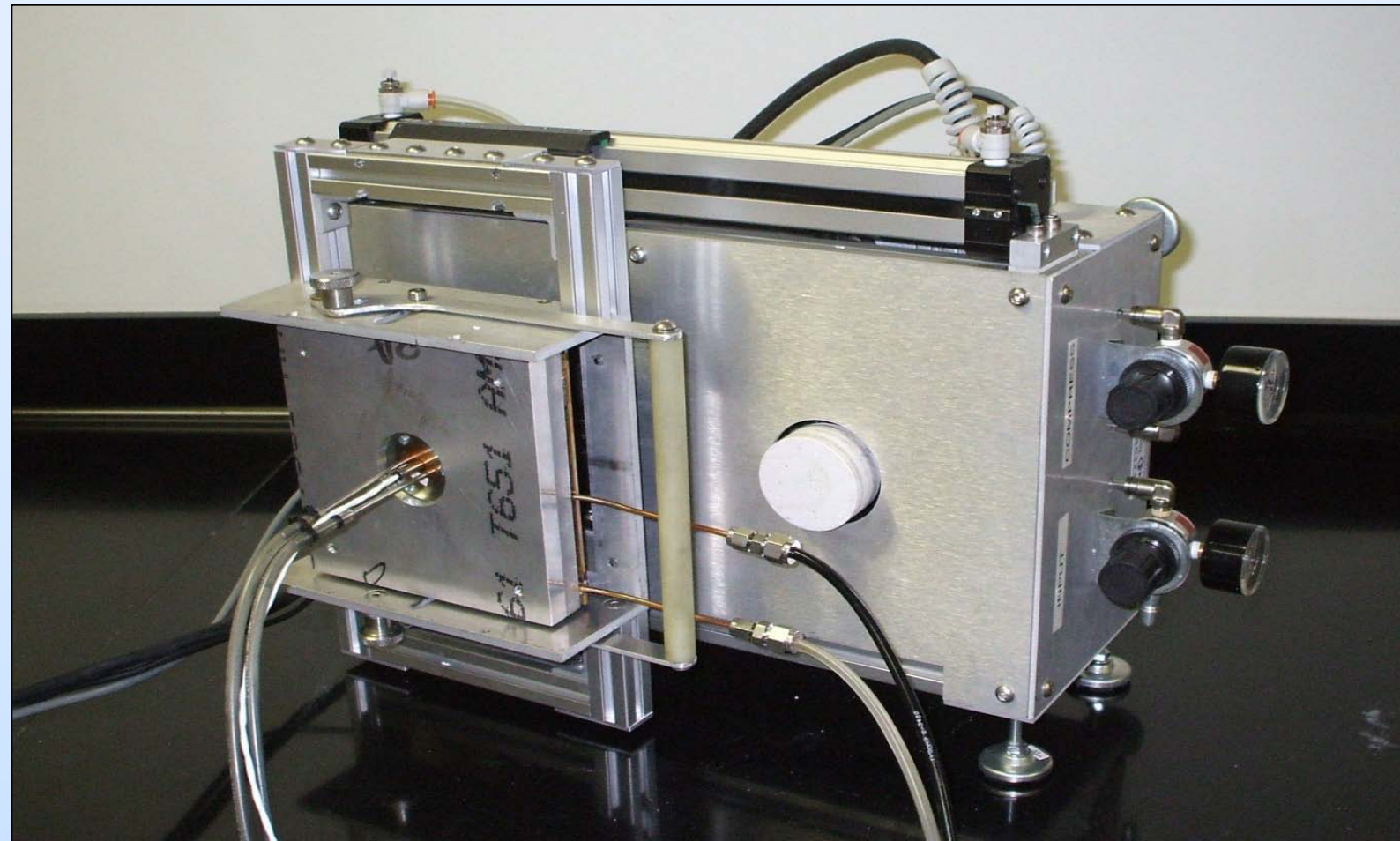


Fig 1. Stored Thermal Energy Test Apparatus



Fig 2. Composite Sample with Reinforcement

Stakeholders

- Firefighters/emergency responders
- Standards development organizations (SDOs) – ASTM, NFPA
- Manufacturers of materials and ensembles



Partnerships



Project activities are part of a multi-organizational project funded by NIOSH and a DHS Fire Grant (2008) through the NFPA Fire Protection Research Foundation



Fig 3. STE Burn Under Visibility Markings

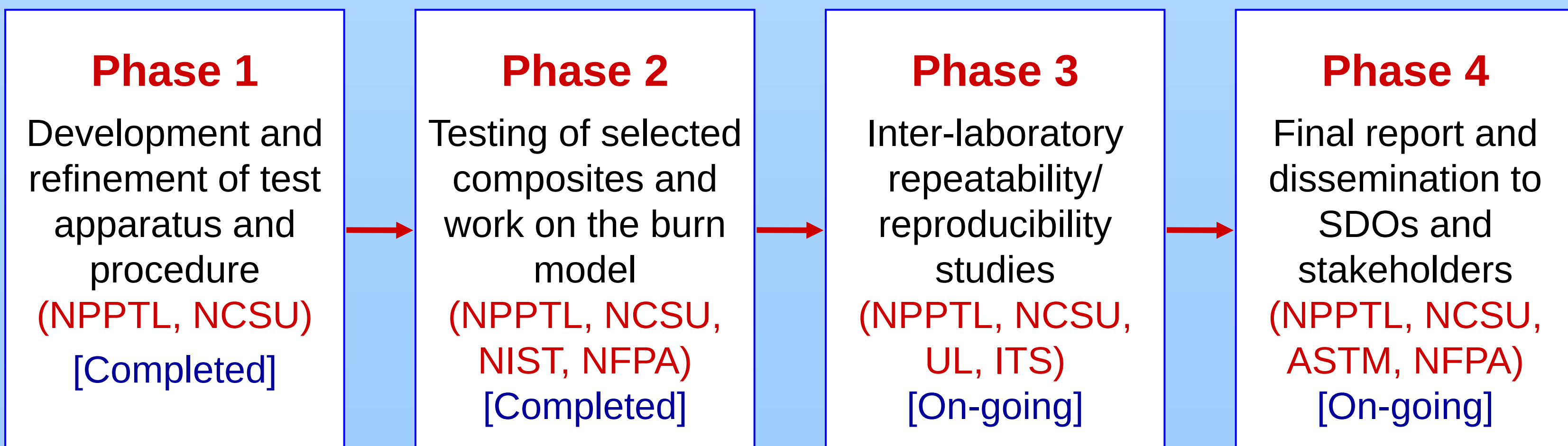


Fig 4. Burns on Shoulder and Arm of Fire Fighter

Background

- Protective clothing or turnout gear is designed to insulate a fire fighter from the thermal environment. A series of protective layers and air gaps prevent the energy of the fire environment from being transferred to the fire fighter.
- Fire fighter burn injuries can occur when thermal energy stored within the layers of the protective equipment are quickly transferred to the skin through compression of the layers.
- Current standards and testing methods do not adequately evaluate the risk caused by STE.

Project History



Disclaimer: The findings and conclusions in this poster have not been formally disseminated by the National Institute for Occupational Safety and Health and should not be construed to represent any agency determination or policy.

Results

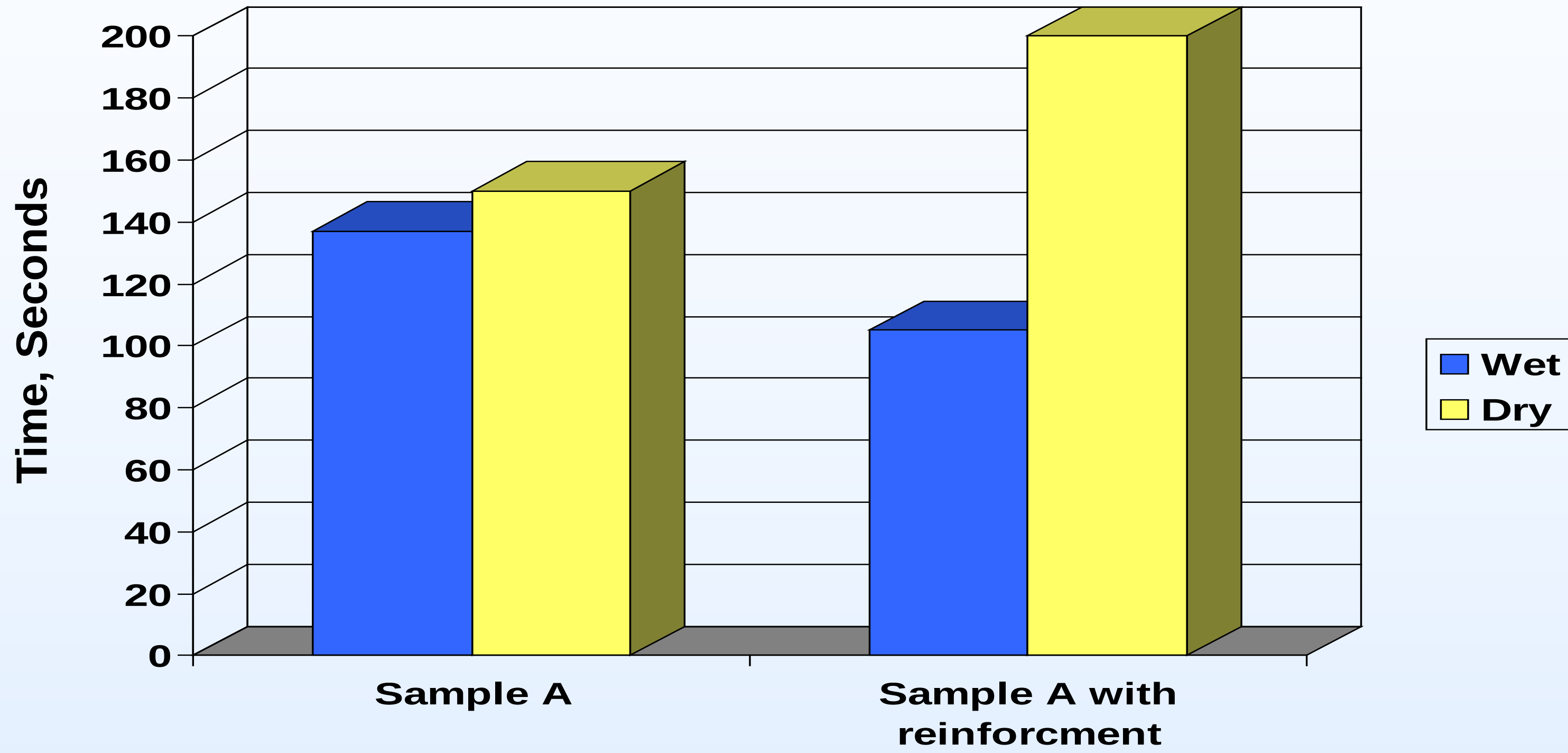


Fig 5. STE Test Results - Time to Second Degree Burn (Composites with and without reinforcement)

Project Timeline

Phase 3 Activity	Completion
Development of a Project Plan	Q3 2009
Set-Up of Experimental Capability at Selected Laboratories and Materials Procurement	Q1 2010
Testing of Additional Specimen Samples/ Combinations by Other Laboratories	Q4 2010
Phase 4 Activity	Completion
Complete Final Report	Q1 2011
Recommend Test Method and Criteria to Standards Organizations	Q4 2011

Completed Project Outputs

- ASTM Work Item WK10531 - Measuring the Transmitted and Stored Energy of Firefighter Protective Clothing Systems (**Approved as an ASTM Standard in 02/2010**)
- Phase 1 Final Report titled, "Development of a Test Method for Measuring Transmitted Heat and Stored Thermal Energy in Firefighter Turnouts"
- Phase 2 Final Report titled, "Thermal Capacity of Fire Fighter Protective Clothing"